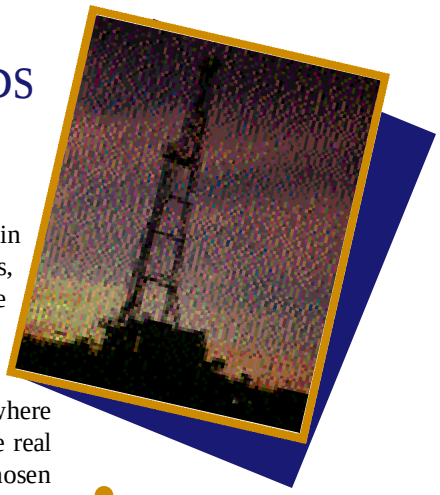
Early Warning Sensor To Find Hazards In Environment



The oil industry can use PSI's imager to detect and monitor the levels of hydrocarbon and chemical releases.

Government facilities, industries, and commercial businesses often share the same problems in protecting the environment. Leaks from storage tanks, spills from waste handling operations, and release of toxic substances during manufacturing all present cleanup problems that must be dealt with to meet the Nation's growing green standards. The cleanup cost can be exorbitant—estimated at hundreds of billions of dollars for Government sites alone.

One way to reduce these costs is by developing monitors that crews can easily carry to sites where pollutants can be remotely detected and measured. Such monitors can pinpoint where the real problems, or "hot spots," are and eliminate the need for crews to be on-site at locations chosen for monitoring. They can help the ecosystem and public health—and ensure the safety of the cleanup crews themselves—by identifying the areas where risks are great. They can also save the taxpayers and industries money by eliminating unnecessary cleanup where no risks are posed.

PHYSICAL SCIENCES INC. IS USING BMDO-FUNDED TECHNOLOGY FOR A HANDHELD DEVICE THAT CAN INSTANTLY DETECT LEVELS OF HAZARDOUS COMPOUNDS FOR ENVIRONMENTAL MONITORING.

Addressing these monitoring needs, Physical Sciences Inc., or PSI (Andover, MA), is using BMDO SBIR-funded technology to develop a handheld spectral infrared (IR) imager. This device can almost instantly detect and quantify levels of hazardous volatile organic compounds, such as gasoline, diesel, and jet fuel—substances that make up about 60 percent of defense cleanup sites alone. The imager can make cleanup efforts safer by warning cleanup crews when volatile organic compounds are released.

Industry can also use the imager to track hazardous gas plumes. For example, it can help engineers at petrochemical refineries detect and monitor the levels of hydrocarbon and chemical releases. BOVAR Western Research (Calgary, Canada) has become keenly interested in working with PSI and its subsidiary, Spectrum Diagnostix, Inc., to manufacture IR imaging spectrometers to identify and track smokestack emissions, such as those from waste-to-energy facilities.

PSI's solid-state spectral imager is based on the electronic tunable wavelength filter developed under BMDO to serve as an early-warning sensor for ground-to-air missiles. PSI has received other funding as well. For example, Lockheed Idaho Technologies, Inc., has funded some of the development efforts for environmental applications, awarding PSI a $420,000 contract through the Buried Waste Integrated Demonstration program.

The spectral infrared imager, pictured above, is lightweight, has low power requirements, and has fast switching capabilities. It can detect multiple contaminants in near real time.

About The Technology

PSI has developed a spectral IR imager that is lightweight, has low power requirements, and has fast switching capabilities so that it can detect multiple contaminants in near real time. It allows full spectral coverage in the 3- to 5-micron or 8- to 12-micron atmospheric window and has spectral (10 centimeters^{-1}) and spatial (0.5 milliradian) resolutions high enough to detect a range of chemical compounds against arbitrary backgrounds.

The imager produces a two-dimensional digital image of the scene in multiple wavelengths using a planar IR detector array. PSI purchased the detector arrays from suppliers such as Amber (Goleta, CA), which developed IR focal plane technology with BMDO funding. Fields of view in excess of 15 degrees are possible with high optical throughput.

PSI's spectral imager could replace open path Fourier-transform infrared (FTIR) and laser diode sensors for monitoring. The projected cost of a unit is $50,000 to $125,000, depending on options and support specified. Current FTIR spectral sensors cost between $90,000 and $250,000.